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PAPER NO. 37.

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Crane (Exmnr) A.U.1623
SN **08/796,040** 02/05/97
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- Device and a Process for the Isolation of Nucleic Acids
- Before the Board of Patent Appeals and Interferences

William E. Player
For Appellant

Examiner's Answer

This is in response to appellant's brief on appeal filed **July 2, 1999.**

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims.

The statement of the status of claims contained in the brief is incorrect.

A correct statement of the status of the claims is as follows:

Claims **1–61 and 69** were cancelled. In accordance with amendments under 37 C.F.R. §1.116, appealed claims **62–68 and 70–81** were tentatively replaced by claims **82–100** (amendment H was not entered), and subsequently claims **62–68 and 70–81** were replaced by claims **101–119** (see Appendix I, *infra*)

The subsequent statement by appellant relating originally appealed claims **62–68 and 70–81** to the claims (**101–119**) presently in Appendix I are substantially accurate, except for the statement concerning claims rejected under 35 U.S.C. §103 wherein

the claim numbers "**62-68 and 81**" should have appeared as -- **62-68 and 70-81** --, and a change in the claims rejected under 35 U.S.C. §112, second paragraph which now specifies that only claims **117-118** are being rejected.

(4) Status of Amendments After Final.

The appellant's statement of the status of amendments after final rejection contained in the brief is incorrect.

The amendment after final rejection filed on **March 30, 1999** has not been entered.

The amendment after final rejection filed on **July 2, 1999** has been entered.

(5) Summary of Invention.

The summary of invention contained in the brief is correct.

(6) Issues.

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims.

Appellant's statement in the brief that certain claims do not stand or fall together is not agreed with because examiner's review of the Henco et al. '**426** reference at column 9, lines 10-15, indicates that the solid supports modified by surface bound anion exchange materials disclosed therein include particle size ranges which clearly overlap with the ranges of particle size specified by claims **110-111** which appellant alleges are directed to a patentably distinct

invention.

(8) Claims Appealed.

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record.

The following is a listing of the prior art of record relied upon in the rejection of claims under appeal.

Number	Name	Date
5,057,426	**Henco et al.**	October 15, 1991
5,075,430	**Little**	December 24, 1991

(9.5) Prior Art Newly Cited and Made of Record.

The following is a listing of the prior art referred to in the "Response to Arguments" section 11.3.

Hames et al., Nucleic Acid Hybridisation - A Practical Approach, IRL Press, Washington, DC, 1985, only title pages and text/index pages 64-65 and 235 supplied.

International Dictionary of Medicine and Biology, Vol. 1, John Wiley & Sons, New York, NY, 1986, only title pages and p. 522 supplied.

(10.1) Grounds of Rejection (under 35 U.S.C. §112, Second Paragraph).

The following ground of rejection is applicable to the appealed claims.

Claims **117-118** (originally claims 79-80) stand rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which appellant regards as the invention.

In claim **117** the term "includes" is incorrect as applied to a compound as said term is used as the equivalent of open language , e.g. --comprises--. Appellant is requested to note that claims directed to chemical compounds are indefinite when terms using variations of the verb "to comprise" or their verbal equivalents are included, because consequently said terms imply the presence of other component parts which are not defined in the instant claims, and therefore the metes and bounds are indeterminate. In claim **117**, at lines 4-5, the structure of the claim is also made indefinite by term "or mixture thereof." It is unclear what combinations of solutes and cosolvents are actually being claiming. The same problem occurs in claim **118** wherein the term "comprises water and Tris" is found indefinite for failure to further define the implied missing components of the buffer.

(10.2) Grounds of Rejection (under 35 U.S.C. §112, First Paragraph).

The following ground of rejection is applicable to the appealed claims.

Claim **117** (originally claim 79) stands rejected under 35 U.S.C. §112, first paragraph, as the disclosure is enabling only for claims wherein the scope of the claimed subject matter is commensurate in scope with disclosed specific embodiments directed to nucleic acid purifications using a single adsorbent only and where alcoholic precipitating solutions do not contain more than three components. See MPEP 706.03(n) and 706.03(z).

In claim **117**, the term "or a mixture thereof" is lacking in proper enablement as no teachings are found which disclose how to use any more than one of the vast array of pH adjusted binary and ternary mixtures of ionic solutes and cosolvents being claimed when practicing the claimed invention. The use of higher order pH adjusted solvent/solute mixtures is not taught herein in any specific embodiment.

(10.3) Grounds of Rejection (under 35 U.S.C. §103(a)).

The following ground of rejection is applicable to the appealed claims.

The following is a quotation of 35 U.S.C. §103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> "A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made."

Claims **101-119** (originally claims 62-68 and 70-81) stand rejected under 35 U.S.C. §103(a) as being unpatentable over **Henco et al. '426** in combination with **Little '430**.

The instant claims are directed to a process for DNA purification with the following steps:
i) cell lysis using an enzyme (e.g. Rnase A) or using a mixture of chemical reagents (e.g. buffered SDS) and debris removal using filtration and/or centrifugation;
ii) contacting the filtrate from step i) with an anion exchange resin in buffers of low ionic strength, and elution of the DNA from the anion exchange resin by contacting with a high-ionic-strength buffer, optionally following the addition of a lower alcohol, or of polyethylene glycol, and
iv) desalting the DNA-containing solution by contacting same with a mineral support material to effect adsorption of the DNA onto the mineral support material (e.g silica gel) followed by washing the adsorbed DNA with alcoholic solutions to remove salts, and elution of DNA from the mineral adsorbent by contacting the mineral support material with a low ionic strength buffer (e.g. buffered Tris) or with water.

Henco et al. '426 discloses a four step process summarized as follows:
i) cell lysis/filtration by any one of numerous known methods including the use of detergents, proteolytic enzymes or mechanical procedures (see claim **8**) including centrifugation (see column 6, lines 51-66);
ii) anion exchange chromatography by transferring the product solution from step i) to an anion exchange resin followed by washing

with a low ionic strength buffer the intended effect of which is to remove all of the interfering substances (e.g. RNA, proteins) from long chain DNA which remains adsorbed on the column optionally in the presence of known DNA precipitants polyethylene glycol or isopropanol (see col. 12, lines 41-42);
iii) elution of the long chain DNA from the anion exchange column adsorbent with high ionic strength buffer; and
iv) desalting the DNA by one of several different methods. One method of desalting not mentioned in the Henco disclosure is adsorption chromatography wherein a sample of DNA is applied to the column adsorbent such as silica gel in the presence of a high ionic strength buffer and separated therefrom by subsequent elution with low ionic strength buffer or water alone.

Little '430 at column 7, lines 12-45, discloses one of several examples wherein DNA is extracted from cells of various types using chaotropic ion/enzyme-mediated digestion followed by centrifugation and ultimately chromatographic separation using a commercial diatomaceous earth (Celite™) and various buffer solutions. As noted in the abstract, Little discloses the application of DNA to the adsorbent from a relative high ionic strength solution, washing to remove salts, and subsequent elution of the adsorbed DNA with a low ionic strength buffer or with water. This reference does not disclose the use of anion exchange resins to selectively retain DNA in a purification process.

Appellant's combination of,
a) conventional cell lysis,
b) the physical separation of cell debris,
c) the anionic exchange chromatography of the filtrate isolated from

the cell debris, and
d) finally desalting of the DNA-containing eluate form the anion exchange column by application to a chromatographic adsorbent (e.g. silica gel) to effect the desalting,

is a combination of process steps well known in the prior art and motivated generically by the disclosures of Henco et al. '426, with specific desalting step details disclosed by the Little '430 reference. As noted supra, Henco does teach the use of DNA desalting subsequent to anion exchange. The failure to teach the specific desalting method of the instant claimed method by Henco '426 has been addressed in the instant rejection of record by combining Henco et al. '426 with the Little '430 reference, wherein the latter reference discloses the utility of classical chromatography adsorbents for the purpose of isolating purified DNA in solutions with low net ionic strength. For this reason appellant's claimed process has been found to be nothing more than a combination of the Henco reference with Little et al.'430, wherein Henco provides the motivation to combine by noting the need to desalt the high-ionic-strength solution of DNA produced by anion exchange chromatography (see column 7, lines 44-46; or col. 12, lines 42-43). The specific details of washing steps, the timing of steps, the specific selection of wash solution contents, and the physical characteristics of the anion exchange resin and mineral adsorbent (e.g., particle diameter, pore size, etc.) are deemed to be variables clearly within the perview of the ordinary practitioner seeking to optimize the Henco and Little process steps for a specific situation. Therefore, the details of adsorbent choice, or other standard performance parameters (e.g. the frequency of washes, the variation of ionic strength in wash solutions, etc.) are deemed to be the kind of variables properly within the realm of routine experimentation by an ordinary practitioner in the course of

optimizing the process steps disclosed in the prior art of record. For these reasons, the instant claims, in so far as they are directed to routine changes in experimental details of the kind noted above, are deemed to lack an adequate basis for a finding of patentable distinction for any variation of the instant claimed process, as such variations are deemed to have been properly included within the scope of the noted prior art.

Therefore, the instant claimed process for DNA purification by anion exchange chromatography followed by desalting using an entirely conventional adsorption chromatographic process would have been obvious to one of ordinary skill in the art having the above cited references before him at the time the invention was made.

(11.1) Response to Argument (Rejection under 35 U.S.C. §112, Second Paragraph).

The term "includes" is synonymous with the term "comprises" and therefore may be fairly presumed to have the same definition in a patent claim, that being that the subject matter delineated in included AND that other subject matter not defined within the claim may be present as well. In the instant dependent claims **117-118** the terms "includes" and "comprises" are not the first occurrence of a "comprising" term, because these claims by definition include the subject matter of the preamble and transitional term of method claim **101**. And lastly, in claim **117** the term "or mixture thereof" at the end of the claim suggests mixtures including components not disclosed in the noted claim, thereby rendering the metes and bounds of the claimed subject matter indefinite.

(11.2) Response to Argument (Rejection under 35 U.S.C. §112, First Paragraph).

Appellant argues that the term "mixture, thereof" was deleted from claim **117**. Examiner respectfully disagrees, noting that claim **117** as presented in Appendix I ends with the term " , or mixture thereof." As appellant makes no other argument, Examiner refers the reader to the rejection of record.

(11.3) Response to Argument (Rejection under 35 U.S.C. §103(a)).

At lines 3-4 at page 7 of appellant's brief argues that "steps c) and d) of claim **101** are neither taught nor suggested [by Henco et al. '426]". Building on this argument appellant further argues that Henco fails to teach the details of the chromatographic desalting of the DNA-containing eluate obtained from the ion exchange steps of the claimed process. Examiner respectfully disagrees. Henco et al. '426 at column 7, lines 44-45 discloses that "... if desired, DNA [in a buffer solution] may be desalted ... ." Desalting may be accomplished in a number of different ways in addition to those specifically suggested in Henco et al., including by the method disclosed in the Little '430 reference.

Appellant then argues that Little '430 fails to include the teachings of Henco et al., but in making this argument, appellant clearly has ignored the structure of the rejection of record wherein the Henco reference is the primary reference and supplies the motivation to combine as noted above, and the secondary Little reference provides the details missing from Henco. Appellant then

argues in conclusion that there is " ... no motivation to combine the two documents ... ." Again Examiner respectfully disagrees. It is plain that Henco teaches a method of separating DNA using ion exchange chromatography optionally followed by "desalting," the teaching of optional "desalting" being the key motivational statement which permits proper combination of the Henco and Little references in the rejection of record.

Appellant then argues beginning at the top of p. 8 of instant appellant's brief that the combination of the Henco and Little references is "overly simplistic," and in support of this view notes specific salt concentrations of the instant claims and further notes that the salts selected include "chaotropic" substances, a class of agents not specified by the Henco reference. Examiner respectfully disagrees with a brief introductory explanation. The term "chaotropic" is defined in International Dictionary of Medicine and Biology, Vol. 1, at p. 522 to be a word describing an agent which " ... destroys the the order of water when dissolved in it and thereby raises the solubility of hydrophilic substances in the solution." Further definitional exemplification is provided by Hames et al. (Nucleic Acid Hybridisation - A Practical Approach) via the indexing of "Chaotropic agents" at p. 235, which refers to pages 64-65 wherein a list of compounds is provided at p. 65, lines 10-12 and includes i) ethylene glycol, ii) sodium perchlorate, iii) tetramethylammonium chloride, iv) tetraethylammonium chloride and v) urea. The Henco reference does not make specific reference to a chaotropic agent but at column 8, line 61 specifies "urea" as a component of the viral lysis mixture. Therefore, contrary to applicant's assertion, Henco et al. does specify the use of a chaotropic agent. In addition, the elution buffers used in Henco contain various

proportions of NaCl, a compound notoriously well known in the art to alter the structure of water, and therefore NaCl must also be a chaotropic agent. The choice of a specific chaotropic agent to be included in an elution buffer is a variation in chromatographic procedure which examiner asserts is clearly within the perview of the ordinary practitioner unless applicant has shown unexpected results. A careful review of the instant and the child file wrapper's contents supports the conclusion that there is presently no such showing, i.e. there is no declaration filed under 37 C.F.R. §1.132 alleging unexpected results.

At p. 8, appellant then contrasts Little's disclosure of chaotropic salt use in elution buffers with the incorrectly assumed "failure" of Henco to use same.

Appellant then questions the motivation of the skilled artisan to rely on Little's process in order to "desalt" Henco's samples, citing the suggested procedures taught by Henco to effect desalting. Henco's teaching that " ... DNA may be desalted ... ," is however, not limited to the suggested processes in Henco. Therefore, examiner respectfully disagrees with appellant concerning the question of motivation. A careful reading of Henco at 7, lines 40-46, makes plain that one or ordinary skill is taught that desalting is an optional step in the Henco process, but that the desalting process is not limited to the processes listed. Therefore, appellant's arguments at the top of page 9 that the use of the increased salt concentrations required by Little's desalting process would be counter intuitive and therefore destroy the motivation provided by Henco. Examiner respectfully disagrees. The increased salt concentration required in the first step of the Little process is irrelevant to the question of

motivation, and fails to provide an adequate basis for appellant's allegation that the increase in salt concentration of the instant claimed process constitutes and "unexpected step."

At page 9, second paragraph, appellant argues that the "filtration step of the instant claim has not been found in the Henco reference. Examiner respectfully disagrees and directed appellant;s attention to Figures 2 and 3 wherein a "frit" labeled "5a" is present in the ion exchange apparatus disclosed by Henco. If used as intended, the noted apparatus would be expected to rely on the frit "5a" to effectively filter insoluble materials from the product of cell digestion prior to contact of said digest with the ion exchanger which in Figures 2 and 3 is labeled "11" and referred to as "porous resin." Therefore, a filtration step is inherent in the use of the ion exchange apparatus in the manner intended as disclosed by Henco et al.

Beginning in the third paragraph of page 9 of the instant brief, appellant argues that the Little '430 reference does not contain motivation to substitute the method of Little '430 for the three desalting methods suggested in Henco et al. Examiner respectfully disagrees, noting column 1 of Little '430 wherein the state of the background discussion of prior art desalting methods teaches that DNA purification methods which rely on i) cesium chloride gradients, ii) ion exchange chromatography, or iii) gel filtration chromatography each have drawbacks associated with the requirement for the use of costly equipment. In the context of the Little reference, the noted teachings clearly suggest that the Little '430 method for DNA purification may be advantageously substituted for at least one of the desalting methods suggested by Henco et al., a

suggestion which examiner deems to be supportive of the motivation found to be present in the Henco et al. reference. In the paragraph bridging pages 9 and 10, appellant quotes out of context a reference to CsCl gradient separations in Little '430 as a basis for finding that Little '430's disclosure does not support the motivation found in Henco et al., an analysis which examiner finds to be illogical.

Appellant's reference at page 10, first full paragraph, to "samples which would be obtained in 'too high a dilution'" is not obviously associated with a failure of the Henco method to apply. The first stage in ion exchange as taught by Henco et al. is application of the DNA containing sample to the exchange resin in the presence of a high ionic strength buffer, conditions which permit the DNA to be adsorbed at the top of the exchange resin, i.e. concentrated from either a dilute or a concentrated DNA-containing sample. Therefore, purification of DNA found in either a concentrated or a dilute DNA-containing sample using Henco's method is deemed to be equally possible.

At page 10, second full paragraph, appellant argues that the Little '430 process is not properly viewed by the skilled person as an "alternative separation method for isolating DNA; not as a mere substitute desalting step." Examiner respectfully disagrees. Appellant's effective agreement that Little '430 is capable of desalting is noted, but the conclusion by appellant that the Little '430 process must be considered primarily as an alternative to the Henco process is deemed to be beside the point. Appellant's claimed process is a multi-step process wherein the two chromatographic steps are i) ion exchange chromatography amd ii) adsorption chromatography wherein elution of DNA from the second chromatographic adsorbent

may be accomplished using liquids which are salt free. Examiner remains convinced that the claimed process is properly considered obvious in view of the disclosure of the Henco et al. reference wherein the teaching of a desalting step by Henco et al. clearly motivates the ordinary practitioner to combine Henco with Little '430.

Appellant in the third full paragraph of page 10 argues that the instant claims effectively predate the Little '430 references report that silica adsorbents can be used in chromatographic processes to desalt DNA-containing solutions. The publication date of Little '430 is October 15, 1991 which antedates the earliest priority date applicable to the instant claims by more than two (2) months, and its filing date antedates by more than one (1) year, facts which appellant may have failed to notice, but which suggest that appellant's conclusions in the noted paragraph are incorrect.

In the same paragraph appellant alleges that the Little '430 process is " not .... a desalting method." Examiner respectfully disagrees. The DNA solutions applied to the silica column in the Little '430 process are salt containing, and the elution of DNA from the column is possible using salt-free liquid, e.g. water. Regardless of how either appellant or Little '430 characterizes the disclosed method, the method is by definition one possible desalting process for DNA-containing solutions.

In the paragraph bridging pages 10 and 11, appellant argues that the combination of Henco et al '426 and Little '430 constitutes impermissible hindsight reconstruction of appellant's claimed invention. Examiner respectfully disagrees. Henco et al. clearly delineates all of the steps of the instant claimed invention including the use of a desalting step in a process of DNA purification. The

inclusion of a specific desalting step, while taught to be optional in Henco et al., nevertheless was taught by Henco, thereby providing the requisite motivation for the ordinary practitioner to seek out all possible methods for desalting, including the method of Little '430. Again, examiner assigns no weight to the assertions of appellant that the Little '430 process is not a desalting process, apparently on the basis that Little and appellant fail to specifically note the obvious and fail to so state.

In the first full paragraph of p. 11, appellant argues that the rejection of record takes statements made in Little '430 "out of context," and therefore that the rejection is flawed. Examiner respectfully disagrees. Again, examiner assigns no weight to such arguments because the facts disclosed in Little '430 as noted above make it plain that the Little '430 process is properly considered to be a equivalent to other desalting methods as taught by Henco.

In the paragraph bridging pages 11 and 12, appellant argues that statements found in Little '430 which disclose possible applications for the Little '430 process render the combination Little '430 with Henco et al. '426 somehow invalid. Examiner respectfully disagrees. Again, the statements cited by appellant represent teachings which do not change the character of the disclosed process which in claim *1* of the '430 reference is directed to " ... the purification of DNA from a liquid mixture ... ." Henco et al. '426 generates a DNA-containing liquid mixture and teaches the optional application of a desalting step to further purify such a mixture, thereby properly motivating the combination of Henco et al. '426 with Little '430.

In the paragraph bridging pages 12 and 13, appellant argues

that the combination of references is backwards, that the Little '430 reference is properly the primary reference and that Henco et al. is properly the secondary reference on the basis that there is no motivation to combine because Little '430 teaches increasing the speed of DNA purification and that such a speed increase cannot be accommodated by a combination of Little '430 with Henco et al., apparently on the basis that two process steps will always be slower than one. Examiner respectfully disagrees. The combination of references has not been altered in the rejection of record and is not herein altered. Additionally, time is not an element of either the Henco et al. process or the Little et al process. Therefore, no further response to this argument is deemed to be required.

In the first full paragraph of page 13 appellant makes a conclusory argument that examiner has used impermissible hindsight in the rejection of record on the basis that the rejection of record has been constructed by "picking and choosing from Little's teachings in a manner that fails to appreciate Little as a whole." Examiner respectfully disagrees. The claims in Little '430 are directed to a method of purifying "DNA from a liquid mixture," which method may effect the separation of DNA from salts in the liquid mixture, i.e. Little '430 is a process of desalting. Henco et al. teaches a multi-step process of DNA purification including an optional desalting step, thereby motivating combination with the Little '430 reference. Examiner therefore fails to see how appellant reaches the conclusion the hindsight reconstruction has occurred in the development of the instant rejection of record.

In the second full paragraph of page 13, appellant argues that the combination of Henco et al. '426 and Little '430 effectively

" ... destroys the invention upon which the [Little] reference is based." Examiner respectfully disagrees. Examiner finds appellant's argument conclusory because appellant has failed to provide a clear statement of how the combination of Henco et al. and Little has in any way destroyed the invention of Little as delineated by the claims found at the end of Little. Appellant's argument that teachings of the Little disclosure as to how one of ordinary skill may chose to apply the Little process have patentable weight greater than the claims of Little is indeed a novel argument, but is not an argument which instant examiner finds convincing.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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